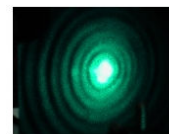


Computational/
Theoretical Physics

NEWSLETTER OF THE DEPARTMENT OF PHYSICS
FULBRIGHT COLLEGE OF ARTS AND SCIENCES

REFLECTIONS



Quantum and
Non-Linear Optics

UNIVERSITY OF ARKANSAS



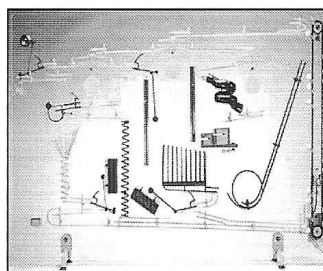
A CENTURY TO REMEMBER

**SPECIAL
POINTS OF IN-
TEREST:**

- Department celebrates centennial
- New faculty hire
- Our Students, faculty, and alumni excel
- Maurer and Hughes Funds reach all-time high

Since our last publication, the Physics Department has outdone itself with awards and advances and weathered changes and challenges with grace and enthusiasm. During these landmark couple of years, we have also celebrated "A Century of Physics in Arkansas, 1907-2007," throughout the 2007-2008 academic year, culminating in a three-day event. Join us as we voyage into the past and future! (Please note that we are only scratching the surface in this issue, but we hope to be keeping in touch more often.)

Reserve University, Diana Buchwald from the Einstein Papers project at Cal Tech, and ending with the Centennial



The George Rhoads Audiokinetic Sculpture

than those in the depths of outer space. Near absolute zero, a large number of particles become locked together in the lowest quantum state. Ketterle observed this phenomenon in 1995 and produced a primitive "laser beam" using matter instead of light.

The April 3 lecture was followed on April 4 and 5 by a set of formal celebratory events, including Professor Raj Gupta's history presentation "A Century of Physics in Arkansas"; talks by current professors highlighting frontier research and education; the unveiling of a *walkway of honor*, an engraving at the building entryway containing faculty names; a George Rhoads audiokinetic sculpture, representing the principles of physics, which will delight the students and public alike and commemorate

See page 2 for more...

The Physics Department Centennial Celebration

The yearlong centennial celebration included a series of talks from such distinguished lectures as Professor Robert H. Austin of Princeton, Professor Emeritus Robert Greenler of Wisconsin, Professor Laurence Krauss of Case Western

Maurer Distinguished lecture entitled "New Forms of Quantum Matter Near Absolute Zero Temperature," given by 2001 Nobel Laureate Wolfgang Ketterle of MIT. Professor Ketterle shared the Nobel Prize for causing atoms to "sing in unison" and discovering a new state of matter. He described the Bose-Einstein condensate, a million

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NEW FACULTY PROFILE: JULIA KENNEFICK

Professor Julia Kennefick's addition as a tenure-track faculty member in August 2007 strengthened the astrophysics/astronomy program and the interdisciplinary SPAC program. An Arkansas native, she received her B.S. from the Physics Department in 1989, working with Dr. Allen Hermann on high-T

superconductors. In 1995, she obtained her Ph.D. in Physics from Caltech in the area of observational astronomy. From there, she went on to complete postdoctoral research at Ohio State University and Oxford University in the UK. She returned to Arkansas in 2003, and was awarded an NSF ADVANCE

Fellowship to continue her astronomy research from 2004 to 2007.

Julia's research has focused on the search for and study of quasars, a subset of the class of objects known as active galactic nuclei, or AGN, which are the active centers of galaxies powered by accretion of matter on to supermassive black holes.

Continued p.2...

PHYSICS CENTENNIAL CONTINUED...

this centennial celebration for years to come; the "A Century of Physics" poster exhibit; the opening of an *instrumentation museum* in the Physics building; laboratory tours and an open house; and a banquet gala attended by about 400 guests. Jazz entertainment was provided by a former chair of this department, renowned trombonist Allen Hermann, who was accompanied by Claudia Burson, Jim Greeson, and Darren Novotny.



JULIA KENNEFICK
continued

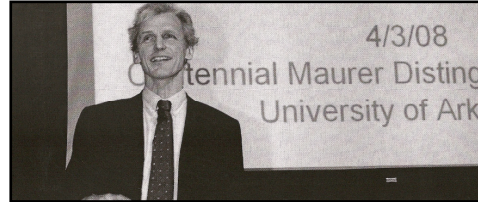
supermassive black holes. Since their discovery in the early 1960's, quasars have been used to trace the structure and evolution of matter in the Universe, and as astrophysical laboratories in which to study their fueling processes.

The early focus of her research was to look for quasars at high redshift, particularly at redshifts greater than 4, which corresponds to look-back times of over 12 billion years. She has conducted several successful searches for these objects, including the discovery of quasars using imaging data from the Digitized Palomar Observatory Sky Survey and a large imaging survey carried out at the NSF's Cerro Tololo Interamerican Observatory using the Blanco 4m Telescope and the Gemini South 8m Telescope, both in Chile. In addition to providing objects for individual study, the main purpose of such surveys is to establish the number of quasars as a function of their luminosity and look-back time in order to trace the history of quasar activity and to gain insights into how they and normal galaxies form and evolve. More recently, she has been studying quasar spectral energy distributions and what they can tell us about the quasar accretion process using data from the KPNO 2.1m Telescope.

Julia is also active in the Arkansas Center for Space and Planetary Sciences, and has recently begun a collaboration with several other Arkansas astronomers, including Daniel Kennefick and Claud Lacy in the Physics Department, and Marc Seigar at UALR. They are in the early stages of developing the Arkansas Galaxy Evolution Survey (AGES) to study the history of black holes in the Universe and their effect on galaxy formation and evolution. They have recently been awarded a 3-year NASA EPSCoR grant to further this research.

About 200 alumni, their guests, and most emeritus faculty came from throughout the U.S. and abroad. Saturday morning, we said goodbye to good friends. All gathered one last time to listen to talks, share reminiscences and anecdotes and to pose on the lawn of Old Main for photographs. Details and reminiscences can be found on our centennial website at: <http://www.uark.edu/depts/physics/centennial/lectures.html>.

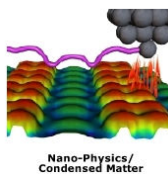
We want to thank all of you who attended for a memorable event. It is a tribute to all of you that this was a century to remember!



Professor Wolfgang Ketterle speaks for the Physics Centennial Maurer Distinguished Lecture, courtesy of Hudson Photography

FACULTY NEWS

- **Laurent Bellaiche**, 21st Century Professor of Nanoscience and Education, was awarded the 2007 Fulbright College Master Researcher Award.
- **Julio Gea-Banacloche** continued to serve as associate editor for quantum information for *Physical Review A*. He is a chair of the QELS 2008 symposium on "Quantum Light-Matter Interfaces" (with Alex Kuzmich and Atac Imamoglu).
- **Eitan Gross** was awarded the Robert C. and Sandra Connor Endowed Faculty Fellowship in 2007.
- **Rajendra Gupta** won the 2007 Fulbright College Master Teacher Award. He also pulled off an incredible year of departmental centennial events. In addition, he has been developing a lab-based course to introduce basic techniques of experimental physics to graduate students. The course was offered for the first time in Spring 2006. He also coordinated the physics component of the undergraduate research conference under the auspices of IN-BRE-Arkansas in both 2007. The conference provided an opportunity to showcase our graduate program to visiting undergraduates via a set of faculty talks, research poster presentations, and visits to research laboratories.



- **Claud Lacy's** 24-inch web-based telescope, of Kimpel Hall provided students the capability and enabled a new teaching style, emphasizing research projects as a major component in astronomy classes at all levels.
- **Lin Oliver, Julia Kennefick, Greg Salamo, and Surendra Singh** won University of Arkansas Outstanding Mentor awards for 2007.
- **Greg Salamo** won the Charles and Nadine Baum Faculty Award for Teaching Excellence, the university's most prestigious teaching award, for 2007. He and Zhiming Wang organized the 14th Annual Semiconducting and Insulating Materials Conference from May 15 – 20 2007 on the UA campus. The conference brought together outstanding academic and industrial researchers from more than 30 nations to discuss advances in nanotechnology and materials science.
- **Gay Stewart** was the University of Arkansas Alumni Association 2007 Teacher of the Year.
- **Jak Tchakhalian** is creating novel interface-controlled materials at the nanoscale to explore their physical properties, many of which are not attainable in bulk materials. His research earned him a \$410,735 CAREER award from the National Science Foundation to continue the research, which was cited by *Science* magazine as one of the top 10 breakthroughs of 2007. He also won Argonne National Laboratory's 2007 award for best scientific result and was awarded best publication, *Advanced Photon Source*, 2007.
- **Min Xiao**, 21st Century Professor of Nanoscience and Technology, served as the general co-chair of the Quantum Electronics and Laser Science Conference, one of the largest international conferences in lasers and quantum electronics.

New awards for research in Physics totaled \$3.5 million during FY 2007. The vast majority of the physics research funds come from federal grants. A few notable awards include a NSF-MRSEC grant to an interdisciplinary team of researchers at the University of Arkansas (led by **Greg Salamo**) and the University of Oklahoma, a NSF-REU program in Modern Optics and Materials (headed by William Oliver), and a \$ 1.5 million grant from the Howard Hughes Medical Institute (HHMI) to a group of scientists led by **Dean Don Bobbitt (Greg Salamo** as a co-PI and **Lin Oliver** as participating faculty). This grant, the largest ever awarded in Arkansas, will implement a program to draw more minorities, women and those students who might not consider careers in science into studies in the sciences. Although the award amount is down from last year we expect the funding to grow with increasing competitiveness of several of our junior faculty members in nanoscience and biophysics.

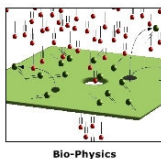
S T U D E N T A N D A L U M N I N E W S

Major Gifts that have made a Difference!

2007-2008 saw landmark contributions to two funds in particular, the **Hughes family** further endowed the Hughes Graduate Fellowship Fund and **Dr. Robert and Mrs. Barbara Maurer** further endowed the Physics Research-Maurer Fund. 2007 was the first year of awarding the Hughes Graduate Fellowship. **Mambwe Mumba** was selected for his work in quantum optics and **Yan-peng Yao** for work in condensed matter physics.

Undergraduates

Three physics majors were accepted into NSF-programs during the summer of 2006 and several REU this summer are eight gifted students: **Ever Ostmeyer, Clint Riley, Ashley Stewart, Josiah Akin** and **Hannah DeBerg** won the SILO/SURF (Student Undergraduate Research Fellowships) award. **Matt Donahue, Matthew Naglak, and Josiah Walton** received National Science Foundation Research Experiences for Undergraduates, and **Elaine Christman** was a Summer Undergraduate Research Fellow. For 2008 honors, **Joseph Snow** has received a Fulbright College Scholarship, **Amanda Schilling** won the William A. and Kathy J. Anderson Endowed Scholarship in Arts and Sciences, and **Christine Nicholson** received both the Metrailler Support Fund and the Hach Scientific Foundation Scholarship. **Matthew Naglak** became a State Undergraduate Research Fellow alongside **Elaine Christman**, who also received an Amgen Fellowship for *Teach for America*. Twenty-three baccalaureate physics degrees (19 BS and 4 BA degrees) were granted in AY 2006 – 2007. Eighteen were awarded this spring (16 BS and 2 BA degrees). Most graduates found employment or were accepted in graduate programs in physics or in disciplines such as mechanical engineering, microelectronics photonics, and medicine.



sponsored *Research Experience for Undergraduate* (REU) others participated in the 2007 REU programs. Joining us for **Cavender, Elaine Christman, Christine Nicholson, Jared Walton, and Kristin Watson**. Two physics majors, **Thomas**

Two physics majors, **Thomas**

Graduate Students

At the graduate level, the department awarded four Ph.D.s (two in physics and two in micro-EP directed by physics professors) and sixteen master's degrees (seven MS, four MA and five MS in micro-EP directed by physics professors) in spring 2007. Most have found employment in industry, as post-doctoral researchers or faculty at universities/colleges in the US and abroad, or are continuing graduate studies in physics or a related discipline. In the spring of 2008, twenty degrees were awarded (7 MS, 4 MAs, and 2 Ph.D.s in Physics and 5 MS and 2 Ph.D.s in micro-EP). **Utsab Khadka** and **Richard Campbell** received a Hamm Outstanding/AAPT Teaching Assistant Award for their commitment to teaching excellence.

Brief Physics Alumni News (Watch for more in future issues!)

Hannah DeBerg won an NSF Graduate Research Fellowship for 2007 and has her choice of Ph.D. programs from among at least six prestigious universities. **Amber Straughn**, a NASA Jenkins Predoctoral Fellow, won an AAS Chambliss Award for her work in space science. **Jacob McElderry**, MA 2007, joined the Eureka campus of the College of the Redwoods CA faculty.

Thank You!!!

The generosity of many of our former students and friends enables the department to award scholarships, invite distinguished lecturers, etc., that cannot be funded through our normal budget. Below are the names of contributors from July 2006 through June 2008. Please forgive any oversights, as we have had a complete staff position change over since the last newsletter! All of you have made a difference. The funds are indicated by **(B)**=Admiral Bryson scholarship fund, **(H)**=Hughes Graduate Research Fund/Fellowship, **(L)**=Lingelbach Memorial, **(M)**=Maurer Research Fund, **(S)**=P.C. Sharrah Scholarship Fund. Those for which no fund is indicated donated to the general departmental fund.

Dr. Richard J. and
Mrs. Susan H. Anderson **(H)**
Dr. Charles H. and
Mrs. Rhonda G. Adams **(L)**
Dr. Ramona L. Bates
Dr. Laurance M. Bryson **(B)**
Dr. Timothy C. Burt
Dr. Thomas O. Callaway
Dr. Darrell W. Collier
Dr. Horace R. Dawson
Mr. John W. Dixon
Ms. Leslie D. Embrey
Dr. William D. Evans
Dr. Fun Fong
Dr. Huaxiang Fu **(H)**
Mr. Scott N. and
Mrs. Teresa A. Harrington
Dr. Allen M. and
Mrs. Leonora Hermann
Dr. Alan Hughes
Mr. Clayton W. and
Mrs. Gina D. Hughes **(H)**

Mr. Randall C. Hughes **(H)**
Dr. Raymond H. and
Mrs. Jane Hughes **(H)**
Dr. Philip B. Hurley
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Dr. Mansour Mortazavi **(S)**
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Dr. Perry R. Rice
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Dr. Azad Siahmakoun
Dr. Surendra P. Singh and
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Ms. Dustin L. Slater
Dr. Jim Spann
Dr. Brenton F. Stearns **(H)**
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Mrs. Margaret Stigers **(H)**
Mr. Miliken Tyler
Dr. Leo L. and
Mrs. Nola R. Van Scyoc **(H)**
Mr. George K. Wallace
Dr. Lawrence D. Weaver
Mr. Michael L. Wolf
Dr. Jan M. Yarrison-Rice

LETTER FROM THE CHAIR

Dear Friends,

Many alumni, former faculty, friends, and guests traveled from different parts of the US and, indeed, the world to join us in our centennial celebration. That so many of you considered it important enough to spend your time and resources to come here means that you value your ties with this department and the people with whom you worked and associated. We are immensely grateful for it, and we value your friendship just as much.

The last couple of years have been excellent years for the Physics Department. Physics faculty members and students continue to perform at a high level as judged by the number of degrees awarded, research expenditure, scholarship and publications, and national and state level honors and awards.

During AY 2007, our faculty, students, and postdoctoral fellows published 69 journal articles in mainstream refereed journals and gave numerous invited and contributed talks at national and international meetings and institutes. These publications are located in some of the most competitive and prestigious journals in physics, including *Physical Review Letters*, *Applied Physics Letters*, *Optics Letters*, *Physical Review*, *Nature* and the *Journal of the Optical Society of America* attest to the high quality of research going on in the department.

Shortage of space for teaching and research remains the most serious challenge faced by the department, impacting both faculty and student morale as well as recruiting and retention. The new nanoscience building will help alleviate some of those space-related issues.

In addition to Professor Ketterle's lecture this spring, we had the honor of having Nobel Laureate Dudley Hershbach, Baird Professor of Science at Harvard, deliver the 12th Maurer Public Lecture entitled "Outdoing Maxwell's Demon: Taming Molecular Wildness," in April 2007.

We would enjoy hearing from you on the progress of your careers and any opportunities for new graduates. Any address or contact information changes are especially welcome. In addition, we want to share your memories and anecdotes of colleagues and teachers from the University of Arkansas. Please feel free to contact us at centphys@uark.edu. We will enjoy reminiscing with you!

Sincere regards to all,
Surendra Singh

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